ENGINEERING NEWS.

Tribune Building. New York City.

GEO. H. FROST, PROPRIETOR.

SATURDAY, OCT. 22, 1881.

THE following are the latest bids for dredging and dock building in New York Harbor: For dredging out the foot of Ninety-sixth street, North River, and building a pier, P. Sandford Ross, for dredging, 35 cents per cubic yard; for pier, $30,839.75; deposit, $200; Thomas and Augustin Walsh, dredging, 35 cents per cubic yard; pier, $30,000; deposit, $200. For dredging and building a pier at foot of Twenty-first street, Thomas and Augustin Walsh, for dredging, 35 cents per cubic yard; pier, $29,700; deposit, $450; John Gillis, for dredging, 30 cents per cubic yard; pier, $31,000; deposit, $450; P. Sandford Ross, for dredging, 35 cents per cubic yard; pier, $133,164.91; deposit, $450.

IN our advertising columns this week will be found proposals for water-works, railway and telegraph and bridge construction; also for paving, masonry and foundation and plastering work. Civil engineers also are in demand at No. 3 Cortlandt street, by a prominent railway company. It is now universally admitted that *without exception* this journal is the *very best* medium in America for advertising proposals for public works. We assert unhesitatingly that more contractors scan the pages of ENGINEERING NEWS weekly for items of construction news than of any other class journal in the country. The cost of advertising proposals in this paper is but a small fraction of the charges of the daily journals, while the results are many fold more satisfactory. Try and see.

WITH the November number Harper's *Monthly Magazine* completes its sixty-third volume, and subscribers who wish to renew are reminded that it is necessary to to do so at once in order to save re-entering their names in the subscription list for the coming volume. It is hardly necessary for us to say anything about the continued excellence of this most popular magazine, which during the past year has been issued simultaneously in England and America, and the circulation of which is constantly on the increase. In the November number is an article of interest to engineers—"Tehuantepec and the Eads Ship Railway"—in which a map of the Isthmus is given and illustrations of the contrivance by which Mr. Eads proposes to transport great ships overland from sea to sea. The author of the article, Mr. Jno. A. Dillon, is evidently not a civil engineer; he is of a very sanguine disposition, and, aside from the illustrations, the article has but little merit as a description of great engineering enterprise. Had it been prepared by Mr. Corthell or some other well qualified civil engineer, it would have possessed more value. As it is, it is interesting reading.

A COMMISSION appointed by Mayor Grace to examine the accounts of the Dock Department of this city since 1870, have reported in a very voluminous document, which concludes with the following recommendations:

"That the department be reorganized and placed in charge of a single Commissioner, who shall act under the direction of the Commissioners of the Sinking Fund; that its duties be restricted to the construction and repair of docks, slips, piers and bulkhead walls, and their proper care and maintenance; that the renting of all dock property be placed in charge of the Commissioners of the Sinking Fund; that the collection of rents and wharfage be made by the Comptroller; that the moneys needed for carrying on the work of the department be estimated for by the Department of Docks and appropriated by the Board of Estimate and Apportionment; that a commission of disinterested and otherwise competent engineers be appointed by the Commissioners of the Sinking Fund to examine into and report upon the safety, stability and economy of the work done, and also of the works now under construction."

PERSONAL.

J. A. Rhomberg, of Dubuque, has bought 6,000,000 acres of land in Mexico.

Messrs. Booth Bros. have the contract for stone paving in New London, Conn., at two dollars per square yard.

C. P. Huntington and other railway magnates were in Cincinnati, O., on the 15th, arranging for the new Kentucky Central bridge over the Ohio, between that city and Covington.

Ralph Gore, one of the principal contractors for sewerage, paving and water-works of the city of Erie, Pa., for the past fifteen years, came to his death on Monday last by the caving in of a sewer, the construction of which he was superintending. He was about 50 years of age.

Mr. Clarence Pullen, Assistant Engineer on the Atchison, Topeka & Santa Fe road, is in the East on a vacation. Mr. Pullen is joint author with Mr. C. C. Chandler of the "Civil Engineer's Excavation and Embankment Tables," a work recently issued, which has been received with general commendation by the profession, and is having a rapid sale.

Mr. J. F. LeBaron, U. S. Assistant Engineer, having finished his surveys for a steamboat canal from the St. John's River to Charlotte Harbor, on the Gulf of Mexico, in Florida, under the direction of Gen. Gillmore, U. S. Engineer Corps, has been appointed Assistant Engineer on the construction of the St. John's River jetties, and the improvement of Fernandina harbor, under the immediate orders of Lieut. Fisk, Corps of Engineers, U. S. A.

Hermann Haupt, General Manager of the Northern Pacific Railroad, announces that B. McHugh has been appointed Superintendent of the Minnesota Division of the Northern Pacific Railroad, in place of H. A. Towne, resigned, and that George W Cross, late Western Superintendent and General Freight Agent of the Empire Line, has been appointed Superintendent of Transportation of the same road.

Mr. Charles C. Chandler, who has been for the past four years connected with the Atchison, Topeka & Santa Fe road, latterly as Office Engineer, has resigned his connection with the above-named corporation to accept the position of Chief Engineer of the Kansas City, St. Jo & Council Bluffs road. Mr. Chandler, who is one of the most promising young civil engineers in the West, has recently followed the fashion so prevalent among the Santa Fe engineers, and taken to himself a life partner, the bride being a charming Massachusetts girl, Miss Julia G. Davis, of Northborough.

A dispatch from Massillon, O., dated Oct. 19, says: "The members of the State Board of Public Works, except Mr. Fullerton, stopped in this city over last night, and continued their journey on the State boat "James A. Garfield" north on the canal this morning. They are on their annual tour of inspection, and were accompanied by the Secretary, A. B. Newbury; J. B. Gregory, Chief Engineer; Dwight Paul, Resident Engineer, and Superintendent L. C. Snell, who has charge of the party."

ATLANTA, Ga., Oct. 18.—The International Cotton Exposition is under full headway. Everything is not yet in place, but will be within ten days. As it is, there is enough to keep an intelligent observer busy for a week. The foreign exhibits are comparatively small, but the American far surpass in number, value and beauty the exhibits of this country at the Centennial. The weather is delightful. The number of visitors increases daily. Several large excursion parties are on the way here this week, and others will come a week later. Thursday, Oct. 27, will be "Governor's day," when a great throng is expected. There is ample provision for the entertainment of all visitors, and the rates at the hotels and boarding-houses are very reasonable.

Sylvester Doolittle, who died in Oswego on the 11th inst., in his 83d year, learned when a boy the trade of a ship carpenter, and in Rochester, in 1822, built and owned the first canal boat that made the trip from Rochester to Albany. She was called the Genesee, of Wheatland, and carried a cargo of flour. For several years Mr. Doolittle built packets and freight boats, and in 1826 removed to Utica, where he built, owned and commanded the first canal boat that passed down the Hudson River to New York. She was called the City of Utica, and carried oats and lumber. In those days all the Hudson River lines carried freight, and none of them would tow his boat to New York. At length he induced a Mr. Hitchcock, who owned a small steamer running independently of any line, to tow him. He moored at Coenties slip, and his queer craft was visited by many curious New York merchants. He reloaded with merchandise, which he delivered at Utica, and soon towage of canal boats to New York became a large business, which it still continues to be. When the railroads destroyed the packet business, Mr. Doolittle removed to Oswego, and built vessels for the lakes. In 1841 Ericsson's invention of the screw propeller engaged his attention. Ericsson met with little success in introducing it, and in consideration of Mr. Doolittle putting it in one of his boats, agreed to give him the right to use it in all the vessels he might build in three years. Mr. Doolittle immediately built the propeller Vandalia, the first screw wheel steamer that sailed the lakes. She made her first trip through the Welland canal to St. Catherines at a speed of six miles an hour. Crowds of people turned out to see her, and a public dinner was given Mr. Doolittle at St. Catherines. The next year he had a line of five propellers on Lake Ontario, and soon they were on all the lakes. Mr. Doolittle engaged heavily in forwarding, milling and elevating, built several blocks in Oswego, and, when over 70 years old, discovered and secured the Deep Rock mineral spring in the bed of Oswego River. He expended $30,000 in this enterprise and invested $200,000 in a hotel built over the spring and called the Doolittle House. He invested his fortune in this venture, and losing his health soon after retired from business.

P. A. Peterson, Mem. A. S. C. E., Chief Engineer of the new bridge over the St. Lawrence at Montreal, was in the city on Wednesday and Thursday, and attended the meeting of the Society on Wednesday evening. Mr. Peterson states that he has a corps of engineers at work on the surveys for the proposed bridge. The bridge is to be built by the Atlantic & Northwestern Railway Company, and is intended to furnish connections and an outlet for the Canada Pacific Railway and the several railways which now have their terminus at Montreal, but are subject to the dictation of the G. T. R. about their crossing the river.

Mr. John Earnst Worrell Keely held a reception a few days ago at his workshop, 1,422 North Twentieth street, Philadelphia, to give another "exhibition" of his "motor." A very complete

discription of the apparatus as far as visible is given in the New York *Times* of the 19th:

Mr. Keely is described as being "53 years old, but looks much younger. He is above the medium height and has a powerful and well-knit frame. The fringe of hair which circles his head is very dark, as are also his close-trimmed mustache and side-whiskers. His eyes are dark brown and deep set. In manner Mr. Keely is deliberate rather than nervous, although he is very quick in his movements, especially when working around his apparatus. He impresses one favorably as regards his earnestness, although he seems destitute of the ability to make himself understood or to explain the nature of his claims in intelligible speech."

"The motor proper is an apparatus about six feet long. It was raised from the floor on a stand. The apparatus consists of three upright portions or cylinders, joined together by a complication of very strong copper tubes. Two of the cylindrical vessels are counterparts. The third, lying in between, is very much heavier, and is nearly globular in form. Its massiveness attracts attention at once. Behind, and a little above it, was a little graduated glass tube, in which was poured the small amount of water necessary in enabling the apparatus to develop its extraordinary power. In front of the apparatus was a siren of common pattern to measure interferences with an air current blown out. At the right of the motor proper was a device for measuring pressure. It consisted of an iron bar, one end of which was attached to a "plunger," a kind of piston-rod, one-third of an inch in diameter, working into a small chamber, to which the pressure of the force evolved was conveyed. The other end of the bar was borne down with heavy iron weights. The bar was supported by a fixed stanchion, close to the end of which the plunger was affixed.

"Mr. Keely claims that he is obtaining and utilizing the force of cohesion, or the force residing in the interatomic ether which physicists have put down as existing in all substances. This he tried to make plain to his visitors by explaining that by means of the introductory impulse and the fifth compound he so impinged on the molecular lead as to disturb the equilibrium, and then to multiply the atomic ether or liberated interatmoic impulse. The inventor, before each experiment, scraped a large tuning fork with a fiddle bow, in order to get the right pitch for the motor, which was hinted to be derived from the force of cohesion."

THE BABCOCK & WILCOX BOILER.

As the result of engineering experience and scientific investigation, the following requisites of a perfect steam boiler have been obtained by Messrs. Babcock & Wilcox.

1. It should be simple in construction and be made of the best materials sanctioned by use.

2. It should have a constant and thorough circulation of water throughout the boiler, so as to maintain all parts at one temperature.

3. It should be provided with a mud-drum to receive all impurities deposited from the water in a place removed from the action of the fire.

4. It should be provided with a combustion chamber, so arranged that the combustion of the gases commenced in the furnace may be completed before the escape to the chimney.

5. All parts should be readily accessible for cleaning and repairs.

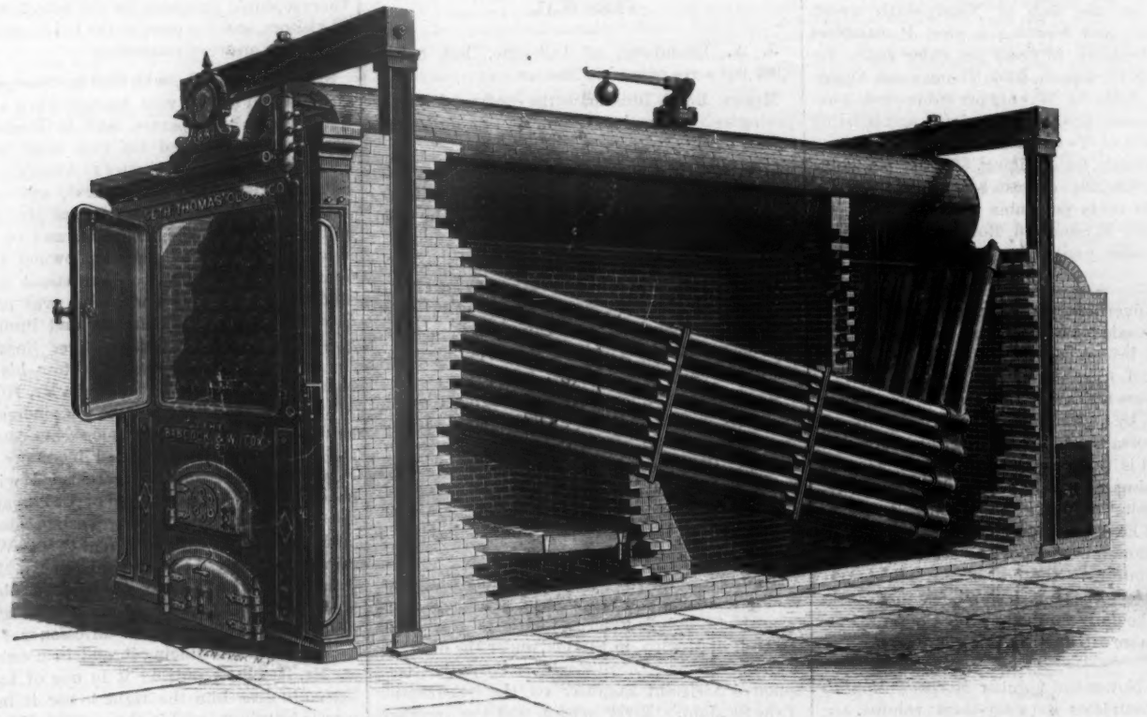
6. The heating surface should be arranged as nearly as possible at right angles to the currents of heated gases, and so break up the currents as to extract the entire available heat therefrom.

7. The boiler should have a large water surface for the disengagement of the steam from the water in order to prevent foaming.

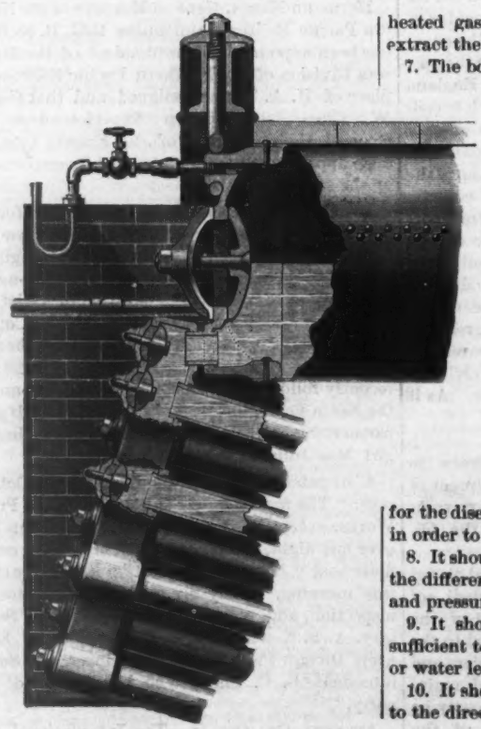
8. It should have large and free passages between the different sections to equalize the water line and pressure in all.

9. It should have a steam and water capacity sufficient to prevent sudden fluctuation in pressure or water level.

10. It should have, if possible, no joints exposed to the direct action of the fire.



BABCOCK & WILCOX BOILER, AT THE SETH THOMAS CLOCK CO.'S, THOMASTON, CONN.



SIDE VIEW—TUBES AND END CONNECTION.

FRONT VIEW—END CONNECTION.

11. It should have a great excess of strength over any legitimate strain, and should be so constructed as not to be liable to be strained by unequal expansion.

12. It should be durable in construction, and not liable to require early repairs.

13. The water space should be divided into sections, so arranged that should any section give out no general explosion can occur, and the destructive effects will be confined to the simple escape of the contents.

14. It should be proportioned for the work to be done, and be capable of working to its full rated capacity with the highest economy.

15. It should be provided with the very best gauges, safety valves and other fixtures.

All the experience gained from explosions, all the literature upon the subject, only prove a want of sufficient strength to stand the pressure. This fault may have been inherent in the original design, but generally it has been due to the weakening of the iron by strains due to unequal expansion of certain parts, caused by unequal heating. When firing up, some boilers will be subjected to intense heat on one part while other parts will be cold; and conditions like these produce strains which ultimately result in rupture. Want of rapid and complete circulation will produce effects tending in the same direction.

The Babcock & Wilcox Water-Tube Boiler is composed of lap-welded wrought-iron tubes, placed in an inclined position and connected with each other and with a horizontal steam and water-drum, by vertical passages at each end, while a mud-drum connects the tubes at the rear, the lowest point in the boiler.

The end connections are in one piece for each vertical row of tubes, and are of such form that the tubes are "staggered" (or so placed that each horizontal row comes over the spaces in the previous row). The holes are accurately sized, and the tubes fixed therein by an expander. These are connected with the drum, and also with the mud-drum, by short tubes, expanded into bored holes, doing away with all bolts, and leaving a clear passage way between the several parts. The openings for cleaning opposite the end of each tube are closed by hand-hole plates, the joints of which are made in the most thorough manner by milling the surfaces to an accurate metallic contact. They are tested and made tight under an hydrostatic pressure of 500 pounds per square inch, iron to iron, and without rubber packing, or other perishable substance.

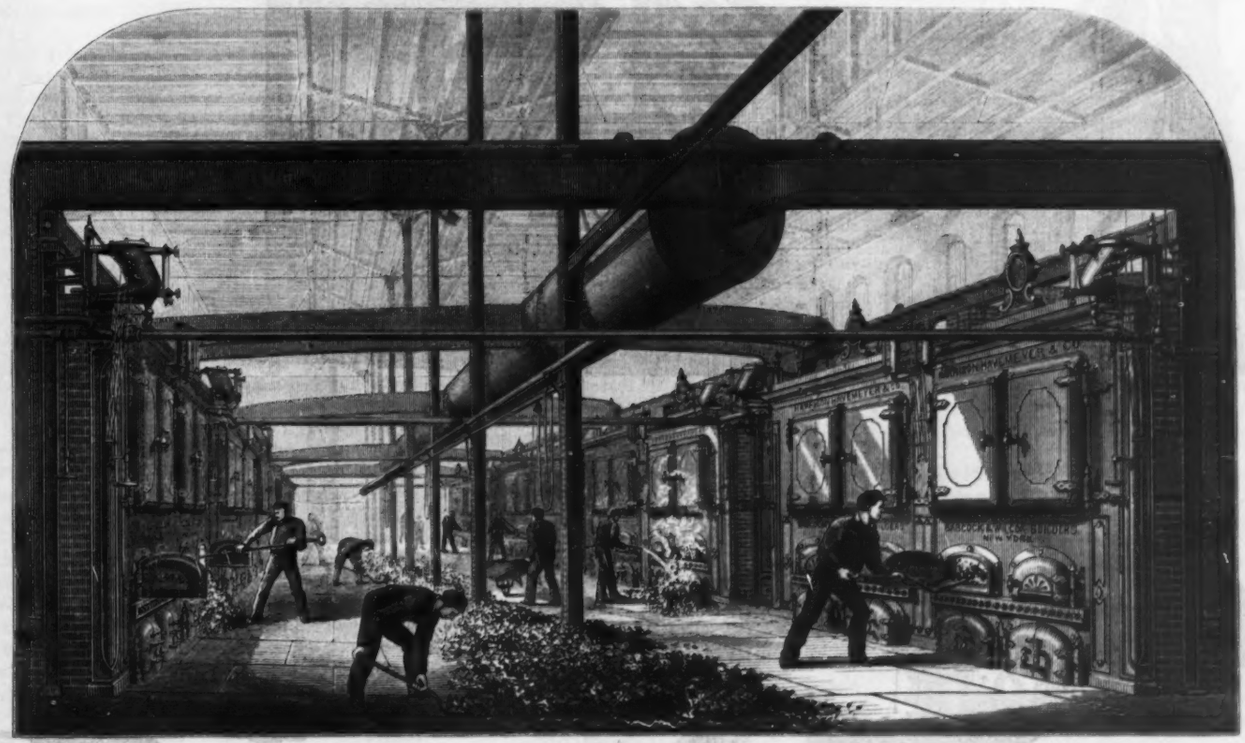
In erecting this boiler it is suspended entirely independent of the brick work or fire front from wrought-iron girders resting on iron columns. This avoids any straining of the boiler from unequal expansion between it and its inclosing walls, and permits the brick work to be repaired or removed, if necessary, without, in any way, disturbing the boiler. All the fixtures, such as fronts, bearers, buckstays, gauges, valves, etc., are extra heavy and of attractive designs.

The fire is made under the front and higher ends of the tubes, and the products of the combustion pass up between the tubes into a combustion chamber under the steam and water-drum; from hence they pass down between the tubes, then once more up through the spaces between the tubes, and off to the chimney.

The water inside the tubes, as it is heated, tends to rise toward the higher end, and as it is converted into steam—the mingled column of steam and water being of less specific gravity than the solid water at the back end of the tube—rises through the vertical passages into the drum above the tubes, where the steam separates from the water and the latter flows back to the rear and down again through the tubes in a continuous circulation. As the passages are all large and free, this circulation is very rapid, sweeping away the steam as fast as formed, and supplying its place with water; absorbing the heat of the fire to the best advantage; causing a thorough commingling of the water throughout the water, and a consequent equal temperature, and preventing to a great degree the formation of deposits or incrustations upon the heating surfaces, sweeping them away and depositing them in the mud-drum, whence they are blown out.

The steam is taken out at the top of the steam-drum, near the back end of the boiler, after it has thoroughly separated from the water.

The esteem and confidence with which this boiler is received by manufacturers may best be learned from a perusal of the following list of prominent firms and corporations for whom the Babcock & Wilcox Company are engaged in filling the respective orders; this lot represents but a portion of the work they now have in hand, and is selected to illustrate the success of their boilers in all parts of the country and among all classes of manufacturers:



BABCOCK & WILCOX BOILERS IN SUGAR REFINERY OF HARRISON, HAVEMEYER & CO., PHILADELPHIA, PA.

900 H. P., Edison Illuminating Co., New York.
1,000 H. P., Chicago City Railways.
1,000 H. P., Pullman Palace Car Co., 2d order.
400 H. P., C., B. & Q. Railway shops.
500 H. P., Flint, & Pere Marquette R. R. shops.
300 H. P., Brush Electric Light Co., Philadelphia.
272 H. P., Thos. Dolan & Co. Dye Works, Philadelphia.
1,100 H. P., Standard Oil Co.
450 H. P., Yngenio Union, Cuba, 2d order.
272 H. P., Conshohocken Worsted Mills, Philadelphia.
200 H. P., Atlanta Cotton Exposition.
250 H. P., American Grape Sugar Co., who have already 4,650 H. P. in use.
200 H. P., W. F. & F. C. Sayles Bleachery, Pawtucket, R. I.
184 H. P., Falls Co., Norwich, Conn.
164 H. P., Cocheco Mfg. Co., Dover, N. H.
309 H. P., Lockwood Co., Waterville, Me.
250 H. P., W. H. Baldwin, Jr., Savage, Md.
250 H. P., Fulton Cotton Spinning Co., Atlanta, Ga.
208 H. P., D. F. Kenner, Sugar, New Orleans.
208 H. P., Kenesaw Flour Mills, Marietta, Ga.
300 H. P., St. Joe Sugar Refining Co., Mo., 2d order.
1,730 H. P., Chicago Sugar Refinery.
416 H. P., Whitely, Fassler & Kelly, Springfield, O.
1,000 H. P., W. C. Hamilton & Son, Paper Mills, Philadelphia.

The address of the Babcock & Wilcox Company is No. 39 Cortlandt street, this city. They have recently issued a very elegant catalogue of their manufacture, which contains much information of a useful character, and which cannot be readily

obtained elsewhere. Many statistics, derived from actual experience, are given, and can be relied upon as correct.

GERMAN DRILLING MACHINES.

The cuts represent new drilling machines recently patented by a German engineer, Herr Meyer of Mulheim-on-the-Ruhr. They are driven either by steam or by compressed air, by the latter naturally in mines and subterranoan galleries. The steam or compressed air acts on a piston moving in a cylinder, and gives it a very rapid movement forward and backward.

A massive rod is soldered to the piston, and on this the perforator is fixed. This drill follows the movement of the piston and strikes from five to six hundred times a minute on the rock, each time turning somewhat on its axis. The machine advances automatically according as the drill sinks into the rock.

Fig. 1 represents a drill specially adapted for sinking wells. The compressed air is carried to the bottom by iron pipes, which are connected with the machine by rubber hose. The pointer of the machine, fig. 2, has four perforators, which can be placed in any direction by simply turning the cranks on the pointer. A rubber tube about 33 feet long connects the air pipes with the colecting pipe of the pointer, from whence the air passes into each machine by a separate arm.

Fig. 3 shows a pointer having two perforators. The machines are supported on a column fixed on a double pipe, one-half containing compressed air, and the other water for sprinkling the holes.

Fig. 4 represents a machine for galleries and mines where one perforator only should be employed.

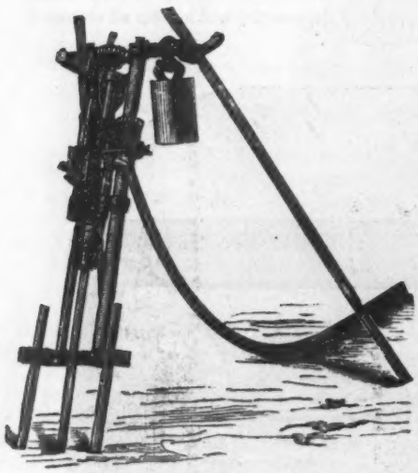


Fig 1.

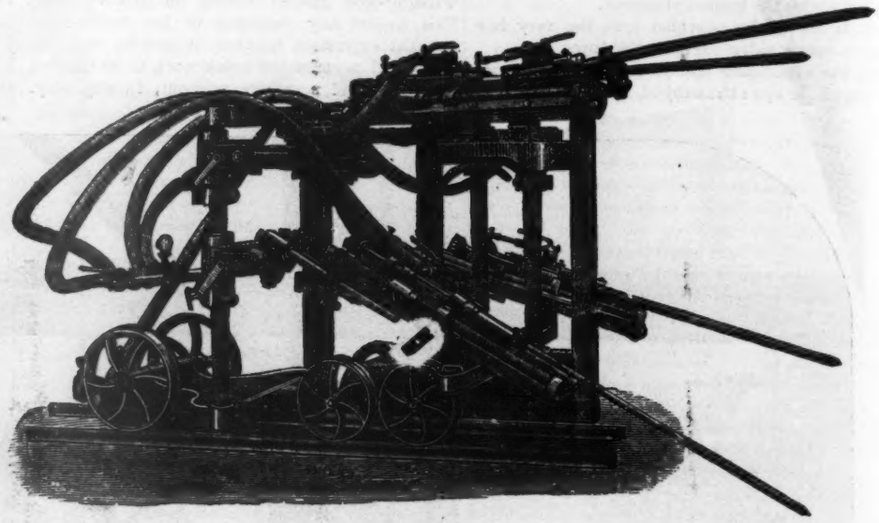


Fig. 2

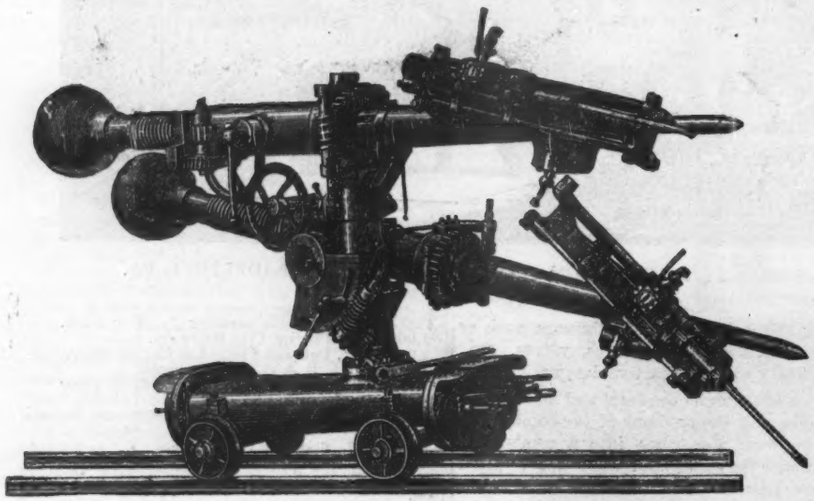


Fig. 3.

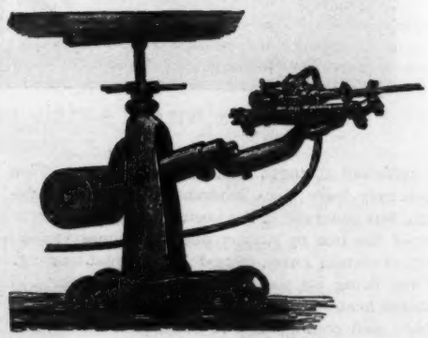


Fig. 4.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 414.)

CXVIII.—PORTLAND.

Portland, Maine., in lat. 40° 39′ N., long. 70° 15′ W., occupies a peninsular that juts out into Casco Bay, and is about three miles long, with an average width of three-quarters of a mile. The land rises each way from the centre of the city to elevations of 161 and 175 ft. respectively. It was first settled in 1632; was incorporated as a town July 4, 1786, and adopted a city charter March 26, 1832.

Under charter of the legislature, approved Feb. 26, 1867, a company was formed for the purpose of supplying the city with water from Lake Sebago, 17 miles distant, and the water was first introduced Nov. 26, 1869. Previous to this time the inhabitants had depended entirely upon wells and cisterns. Lake Sebago is 14 miles long and 6 miles wide, and has a water-shed of 500 square miles. Its only outlet—the Presumpscot River—is controlled by a masonry dam built in 1879, at a cost of $50,000. The height of the lake above high water at Portland is 267 ft.

The water from the lake is received into a box conduit 4 ft. square, fitted with screens, and then passes through an oval brick conduit 5,440 ft. to a second gate-house, from which it is delivered into a wrought-iron and cement pipe 20 in. in diameter, and brought to the city, which is supplied directly from the lake. A reservoir of 12,000,000 gallons capacity is constructed on Branchall's Hill, and its contents held as a reserve in case of any accident to the main pipe. The water is kept fresh and pure by discharging into it nightly the surplus supply.

*Copyright 1881.

In 1876, the supply not meeting with the requirements of the city, a new main of 26 in. in diameter, of wrought-iron and cement was laid to Ward's Hill, a distance of four miles from the lake, and then, reduced to 24 in., was continued to the city. The capacity of the two mains is estimated at 7,500,000 gallons daily, which is more than sufficient for the wants of the consumers.

The distribution first laid in the city is of wrought-iron and cement, from 16 to 4 in. in diameter. All pipes laid since the first contract have been of cast iron. There are now 32 miles of main pipe and 38 of distribution pipe, with 242 fire hydrants, 4,616 taps and 43 meters. Galvanized iron is used for service pipe, as the purity of the water rapidly oxidizes plain iron, reducing the supply, and even cutting it off entirely.

The population of the city in 1880 was 33,810. The consumption is not given. The works are controlled by a board of five directors. Geo. P. Wescott is superintendent and general manager.

CXIX.—DES MOINES.

Des Moines, Iowa, is located near the geographical centre of the State at the junction of the Des Moines and Raccoon rivers.

The city was incorporated May, 1857. The population in 1870 was 12,034. In 1871 a charter was granted and water-works were built, by a company of which Messrs. Polk and Hubbell were the chief managers, the city agreeing to pay a stipulated sum annually per mile of the mains laid in the streets for fire protection, the city furnishing the hydrants. In the month of May, 1872, the city accepted the works as efficient for protection, 10 miles of pipe being laid and 110 hydrants set. Since then there have been 10 miles more of pipe laid, aggregating 20 miles of cast-iron pipe, ranging from 16 to 4 in., with 190 double fire hydrants of the Holly pattern.

The water supply is taken from a gallery of iron cylindrical chambers sunk 12 ft. below the bottom of Raccoon River, the top being tightly covered, the water filtering through the sand and gravel, entering the chambers at the bottom. The supply is of excellent quality generally. The water is pumped directly into the mains under a pressure of 80 lbs. to the square inch for domestic service, and as much higher as necessary for extinguishing fires, by eight 14 × 12 in. piston pumps working in gang; there are also as a reserve four elliptical rotary pumps. The estimated capacity of the pumps combined is five million gallons in twenty-four hours. They are operated by two Holly duplex engines, with two vertical and two horizontal tubular boilers.

The population of the city in 1880 was 22,696, and the daily consumption 1,300,000 gallons. The cost of the works as reported in June, 1881 (the annual report), including interest and maintenance, was $388,618.39.

The receipts for the water rents collected for the same year were $46,268.88.

The works, since April, 1880, have been managed by a board of nine directors. S. Van Cleve has been superintendent and engineer since 1872.

CXX.—UTICA.

Utica, New York, is on the south bank of the Mohawk River in lat. 43° 6′ N., long. 75° 13′ W. Fort Schuyler was built in 1758 on the site of the town, which was founded in 1757, incorporated as a village in 1798 and as a city in 1852.

In 1849 water-works were constructed by a private company, taking water from streams draining a water-shed of 16 square miles of broken land, chiefly used for grazing and having a slate substratum. About one-third of the area is in woodland. The first reservoir constructed has an area of about 10 acres and is 30 ft. deep. A pipe led from it to a distributing reservoir on Corn Hill, between High and Chatham streets, which was abandoned some years ago. In the vicinity of the upper reservoir are the Graefenberg Springs, at one time a celebrated hydropathic establishment. The water from this reservoir now flows in the stream for about 2½ miles, passing over Buttermilk Falls with a fall of over 60 ft., and half a mile below them sinking into fissures in the slate rock, reappearing again 360 ft. further down stream, and entering the second reservoir, which has an area of 50 acres, and was constructed in 1873 by building an earth dam 65 ft. high across the ravine.

From this reservoir the water is conducted in a 12-in. pipe to the Pleasant street distributing reservoir, a mile distant and 60 ft. lower, which was built in 1867, and has a water surface of 11 acres, with a depth of 22 ft. at 80 ft. above the highest point in the city. A small stream flows into this reservoir, the water of which is diverted by a by-wash when muddy.

A 20-in. main distributes the water to the city.

Distribution is by cast-iron pipes, of which there were, in 1879, 30 miles laid with 190 hydrants. The number of taps is not known.

The population in 1880 was 33,91s. The consumption is not known, and statistics of cost and revenue have not been furnished.

In 1878, C. W. Pratt was superintendent; B. F. Ray, Secretary of the company.

(TO BE CONTINUED.)

AN ANCIENT AND BOTTOMLESS PEAT-BED.

On the extension of the New England road from Brewster's to the Hudson there is one of those peat-beds like the one which, near Wallingford, has caused the Consolidated road so much trouble. This one west of Brewster's required over 600 car loads of earth to fill it before a foundation could be had for the abutments of a bridge across the shallow pond. For this structure, piles, one upon another, have been driven 110 ft. into the peat, and the longest goes down 114 ft. below the surface. A 3,000-lb. weight has been used in driving them, and, at the last fall of this immense hammer, a fall of twenty or thirty feet, would drive the piles only half an inch, so great was the friction on the sides of the piles. As it was, bottom was not reached after all; the friction on the piles sustains them. Some 70,000 or 80,000 cubic yards of earth have been dumped into this pit.

CORRESPONDENCE.

FORCE OF A DROP HAMMER AND FLOW OF WATER.

NAPANEE, Ont., Oct. 10, 1881.

EDITOR ENGINEERING NEWS:

We are using a pile driver, weight of hammer equals 1,200 pounds, height of fall equals 30

feet. Can you tell me of any way to calculate the force with which the hammer strikes the pile?

2. How much water will flow per second through a pipe 2½" diameter as shown in accompanying sketch?

A is a pipe through which water is forced. Steam coming through *B* is condensed by it. *C* is the point of aperture, and is made small so that there will be a constant head for condensing purposes; the height of water above *C* is 16 feet.

If you will kindly give these questions insertion in your next issue you will oblige,

SUBSCRIBER.

TECHNISCHER VEREIN.

NEW YORK, Oct. 14, 1881.

EDITOR ENGINEERING NEWS:

DEAR SIR: Following please find list of officers elected at the annual meeting of the Technischer Verein (Technical Society), New York, on Oct. 8: president, Augustus Kurth, Brooklyn; vice-president, Emil Wohlers, New York; corresponding secretary, Max C. Budell, New York; recording secretary, Wilhelm Baur, Brooklyn; treasurer, Paul Goepel, New York, librarian, Geo. W. Wundram, New York. Respectfully yours,

MAX C. BUDELL, Cor. Sec.

287 Broadway, N. Y.

COL. WARING'S SEWERAGE PATENTS.

EDITOR ENGINEERING NEWS:

A paragraph in the *Sanitary Engineer* of Oct. 1 states that Mr. Waring has been reporting on the sewerage of Norfolk, Va., and that in the estimate of cost thereof he includes two items, viz.: 10 per cent. for engineering and 10 cents per foot of sewer laid for royalty.

It is presumed that this royalty must be for some patent rights, and as this is the first instance which I have noticed of a charge being made for royalty for a system of sewerage, it offers a fair opportunity for a discussion on the subject, in the interests both of the profession and the public; and I therefore ask for space in your journal for that purpose.

Mr. Waring's patent is No. 236,740, dated Jan. 18, 1881.

The specification says: "The invention consists in providing a system of sewerage for the collection and removal of house-waste and foul waters, and their removal—independent of the removal of storm water—through one main pipe to each system; providing flushing tanks at the ends of the branch pipes; connecting the house drains with the sewers by a branch as large at their junction as the sewer, and ventilating the system by providing open gratings to admit air to the sewers and connecting house drains with the sewer without, the use of traps, extending the same above the house, so as to insure a continuous circulation of air through all parts of the sewer.

"The invention further consists in laying into the same trench with the sewer pipe a drain pipe, and in the peculiar and novel devices, more fully set forth hereinafter, by which the construction of the system is facilitated and its continuous and efficient operation secured."

The specification then goes on to describe the advantages, etc., of using small pipes, and the several peculiar and novel devices, and then claims "as new."

1. The improved system of sewerage herein described (a), the same consisting in a main sewer pipe gradually diminishing in size, and provided with branches, (b) on the ends of which automatic flush tanks are provided, constructed to flush the branches and the main sewer, (c) connecting sewers extending from the sewer pipe or branches into and through the houses, forming an open flue from the sewer to the top or practically to the top of the house, and (d) air inlets constructed to ventilate the sewers, substantially in the manner as described.

2. The improved system of sewerage and drainage, the same consisting in the combination, with a system of sewer pipes and branches constructed to discharge the sewage inde-

pendent of the storm water, as described, of a system of subsoil drains, laid in the same trench with the sewer pipe, as and for the purpose set forth.

3. The combination, with the main sewer pipes, of the branch pipes made at their junction of the same size as the main pipes so as to discharge the liquid on a line with the bottom and withdraw the air on a line with the top of the pipe, as and for the purpose set forth.

4. The combination, with air inlets to a system of sewers—of a house drain connected with the sewer by a connection practically of the same height as the sewer extending to and through the house, constructed to ventilate the sewer, as and for the purpose described.

5. The combination, with a system of sewer pipes, constructed to discharge the sewage independent of the storm water, of flush tanks located at the heads of the branches, air inlets and house connections extending through to the house top, without traps between the house and the sewer, constructed to clean the sewer pipes by the rush of water from the flush tanks, and ventilate the same by currents of air passing in by the air-inlet and out by the unobstructed house connections, as described.

6, 7, 8, 9, 10, 11, Minor unimportant improvements, in construction of flush tanks, laying pipes, etc.

These being the inventions and improvements etc., for which he has obtained a patent, let us examine into his right to claim these as his inventions.

1 (*a*). This claim is practically the attempting to monopolize the use of the principles of hydraulics, which are the common property of every one who can read and understand the formula for flow of water in pipes, which have been established by Eytelwein, Dubuat, Prony, Weisbach, etc., years before Mr. Waring was born, for how is it possible to properly lay out a system of sewerage, without proportioning the sizes of the sewers to the work they have to perform, and therefore gradually diminishing the size of the mains and providing them with branches?

To do so, cannot be claimed as an *invention* by Mr. Waring.

1 (*b*). Mr. Pilbrow, 20 years ago, constructed the sewers of Tottenham, near London, on the separate system (exclusion of storm waters) and in Vol. XLI. of the Minutes of Proceedings of the Institution of Civil Engineers, Part 3, 1874–75, he gives a description of the works thereof, from which I will quote: "To thoroughly drain and sewer the towns by well-laid stoneware tubular drains and sewers at proper levels, with the best inclinations that are possible, and to exclude therefrom all surface water and land springs," and "considering that the new systems excluded all surface drains and unprotected drain heads, and only afforded slight means of ingress to the sewers through small drain pipes and traps belonging to the water closets and sinks," and "at the head of branch or lateral sewers (especially in courts and alleys), flushing shafts were placed. Near these a fire cock, or hydrant, was always erected, so that when the branch sewer required flushing, or testing, a short length of canvas hose, was attached to the hydrant and the other end turned into the flushing shaft. The water when turned on rushed along the sewer, and if the latter were clear of impediments, flowed into the main sewer;" and "the shafts went gradually out of use."

"In many cases a 1½-inch iron pipe, with stop cock, carried from nearest water pipe to head of branch sewer."

"But neither during the first seven years of the working of this system, for which time the author had the supervision of it, nor since, a period altogether of 23 years, has there been a case of stoppage of these pipes."

Mr. Latham, in his work on "Sanitary Engineering," American edition, 1877, pp. 33, 34, goes into the subject of flushing and describes automatic flushing apparatus.

It is evident, therefore, that flushing sewers by apparatus attached to the ends of branches is not new, and could not have been invented by Mr. Waring. Neither did he invent the Fields flush tanks, and as the use of some sort of a flushing apparatus, automatic or otherwise, is open to all who desire to use it, so the purchaser of a Fields tank cannot be debarred from using it as he thinks fit; otherwise, what is it sold for?

Mr. Waring cannot, therefore, claim a right to patent the flushing system.

1. (*c*) Mr. Pilbrow, in his paper, says: "If the flow of sewage be moderately active and the outlet of the sewer be free, little or no gas will pass up the drains to the houses. The chief source of the noxious odors rising into houses is their own drains and traps, and the only effectual remedy, appears, to the author, to be by ventilating the house drains instead of the sewer, which, nevertheless, is, by this means, greatly benefitted. The best method of accomplishing this is believed to be by constructing the water closets, where there are more than one, above each other and having a 4-in. vertical pipe extending from the basement to above the ridge of the roof and open at the top. Into this vertical pipe every water closet should empty itself by a syphon water trap. This plan has never failed, and it is evident that if all house drains were thus dealt with, further ventilation of the sewer would be unnecessary, for should any gases pass from it toward the house they would escape up this pipe rather than through the water of the traps."

"*When it is desired that the pipe should act as a ventilator to the sewer the trap must not be inserted.*"

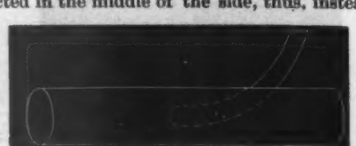
Mr. Latham in his work, fully discusses the subject of ventilators and in Plate XI., p. 44, a section of a house is shown with a ventilating pipe connected to the sewer without a trap and extending to the roof.

Mr. Waring cannot therefore claim this as his invention.

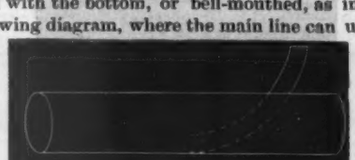
2. Mr. White used drain pipe in sewer trenches at Oxford, and Mr. Latham describes their use at Dantzic, p. 51, and Fig. 17, Plate XV.

Mr. Waring cannot therefore claim this as his invention.

3. In the Minutes of Information of the General Board of Health, London, 1852, p. 85, we read: "For example, junctures of pipe drains were often effected in the middle of the side, thus, instead of



level with the bottom, or bell-mouthed, as in the following diagram, where the main line can under



no circumstances be so full at the point where the branch would enter as to require additional space for its reception, *a junction of equal capacity should be used.*"

Mr. Waring, therefore, did not invent this form of junction.

4. This is the same as 1 (c).

5. This is the same as 1 (b), 1 (c).

The other so-called improvements are so unimportant as not to be worth discussing, and Mr. Waring is welcome to all the patent rights he can claim thereon.

It is necessary to mention that Mr. Waring admits he was familiar with the Board of Health works and that he had read Latham; in *Sanitary Engineer*, June 15, 1881, so he cannot claim a want of knowledge of these *inventions*, or that they were not all in use or published before his patent was applied for.

I think I have fairly disposed of Mr. Waring's claims as an inventor, and so relieved the profession and the public of the incubus of a royalty; and I now propose to say a few words as to the actual value of these *inventions* in practice.

1 (*b*). As to the flushtank Mr. Pilbrow's experience goes to show that it is unnecessary, and that the essential qualification of these small sewers is the property of keeping themselves clean without extraneous aid.

This was also the conclusion of the Board of Health; thus, with respect to the action of the pipes, the "result of this change, which has now (1852) been in operation more than three years, proves that notwithstanding intermittent and ill-applied supplies of water, the force of the sweep of 4-in. tubular drains, properly laid, keeps them clear of all deposit, and also further proves that they require no extraordinary flushings.

"Since experience has proved that the smallest tubular house drains, which have, in proportion to the flow of water, the most friction, are kept free from deposit, without special supplies of water, or flushing, we may be perfectly certain that the larger mains, when due adaptations are made in respect to form, size, material and inclination, having, in proportion to the run of water, much less friction, will be kept clear by the same, but more-concentrated runs of water. This has also been established by the evidence of actual practice, where there are sufficient natural inclinations for the discharge of the sewage.

"The end accomplished is in fact *natural* and *constant* flushing, for the *prevention* of deposit, to supersede *artificial* and *occasional* flushing for its *removal*."

Mr. Pilbrow says the velocity in the Tottenham sewers was at the average rate of above 2½ miles per hour, and the stream was sufficient to carry down stones and pieces of brick of large size.

So far, therefore, as experience and opinions of experienced authorities go, it would appear that we may trust a system of sewers, laid out on a properly-graduated plan, to keep itself clean without special means of flushing, and so not need to come in contact with Mr. Waring's patent right; assuming that it is valid.

1 (*c*). As to the necessity for ventilating pipes, we will again quote Mr. Pilbrow.

"Although, as a precaution, such ventilators were made (by shafts), experience seemed to prove that they were not so much required for this purpose as was generally supposed.

"It was found that in a close and perfect pipe sewer, such as that in Tottenham, having few openings directly to the atmosphere, the surface of the stream of sewage water, acting by friction on the air or gas, which occupied the upper part, carried the latter along with it.

"So powerful was this effect that on making a small opening near the top of the pipe, there was an indraught of air, in place of an escape of gas, sufficiently strong to draw the flame of a candle into the hole, and in one instance nearly to extinguish it."

Certainly no patent or other power can prevent me from dispensing with a running trap to my house drain, if I like to commit such an unsanitarian act, and if so, what is to prevent the sewer gas, if any, from going up my soil pipe if it likes

to do so? Surely I am not to be asked to pay a royalty for its' so ascending.

2. The sub-soil drains are no doubt of some value in certain soils; but if so, they are clearly free articles of use.

2. As to the bell mouth junction, I do not think there is any advantage in its use; a junction of a branch, with a main running half full, ought to be at such a height that the branch would also run half full without being blocked by the main, which it would be if it joined at the bottom. The mean thread or fibre of the branch current, as hydraulicians call it, should join the thread of the main current without shock or disturbance, and that will be effected in the best manner when the surfaces are on the same level.

Mr. Latham, p. 33, says "the proper position for a junction is within the water line, but not so low that the flow from it would be checked by the sedimentary deposit that will be rolled along the bed of the sewer."

We may therefore continue to use the junctions as already made without any fear either of failure or of Mr. Waring's royalty.

The matter of the payment of a royalty in this particular case of Norfolk, of course, only concerns the parties thereto, but the consequences resulting therefrom are of serious importance to the profession and the public generally, because if this instance is made a precedent, and the idea should become fixed, that no city or town can be properly sewered without having recourse to Mr. Waring or his patent rights, the profession is unfairly and heavily handicapped, and the ignorant public imposed upon.

With the object, therefore, of ventilating this matter publicly, I address this communication to you, and ask your editorial aid to assist in the matter. Yours, GEO. KENT RADFORD,

Member Inst., C. E.

SHEETING AND BRACING SEWER TRENCHES.*

It may be interesting to some of the members who have not had practical experience in bracing different kinds of trenches, to know how this kind of work is done.

The simplest kind of bracing is that known as stay bracing, which consists of two planks placed vertically on opposite sides of the trench, and held in position by horizontal braces. The distance between the pairs of planks, and the number of braces to each, depends of course upon the nature of the ground and the depth of the trench. This kind of bracing can be used in good ground, not loose material, but such as will stand almost alone.

In Fig. 1 is shown what is termed boxing, or horizontal bracing. Here the planks are placed horizontally, with vertical rangers separated by the braces. This is applicable where the ground is able to stand for three or four feet without caving; but in running sand or loose material it is neither so practicable nor safe as some other kinds. It is also very difficult to take out this kind of bracing in bad ground, and it frequently happens that it costs more to remove the planks, braces, etc., than they are worth.

Fig. 2 shows what is termed poling-board bracing. Almost any kind of planks or boards may be used, from one to four inches thick, six to twelve inches wide, and three to four feet long. The polling-boards are set vertical, with horizontal rangers placed midway between the top and bottom of the boards and braced as shown. This is the common mode of sheeting or bracing in England. The writer thinks the plan is more applicable than boxing, and can be done cheaper. It is easier taken out as the trench is back-filled, lighter to handle, and does not take so long to set up. Where vertical rangers are used, it is difficult to remove one or two planks at a time while backfilling is taking place; but in the case of poling-board bracing, when a set of braces is removed, the corresponding poling-board can be easily taken out.

In very bad ground, such as running sand, the writer thinks there is no kind of sheeting that answers the purpose so well as the vertical sheeting or bracing shown in fig 3. Here the planks, generally two inches thick, are placed vertically, and their feet chamfered on the inside, and their heads trimmed to admit of a sheeting cap, so they can be driven with a maul without battering their heads. In England they are sometimes hooped with iron. The caps in this country are generally made of cast-iron; some of wrought-iron, however, used in this city, have worked very satisfactorily, being lighter and more easily handled. In setting up this kind of bracing, the vertical planks are put in first at the points where the braces are to go; then the rangers are placed in position and held by iron dogs or temporary braces; and after filling in solid behind the planks with earth, the strong braces may be inserted, and this part is then ready for driving. When the planks are driven low enough for another set of rangers, they may be put in without the aid of temporary braces, as the planks are firm enough to keep in position. This kind of sheeting has many advantages over the other kinds mentioned. If it is desired to fill in around certain portions of the work, such as arches, inverts, etc., the sheeting can be drawn up a little at a time and still keep everything firm; and also, when water pipes, other sewers, buildings, etc., are met, the sheeting can be drawn to suit the work.

It is very difficult, in some cases, to determine beforehand what sizes of timber to use, especially for the rangers and braces. The writer was one of the foremen upon the trench described in Mr. Clarke's paper, read before the society, where so many eight-inch by eight-inch braces failed in an 18-foot length of trench. In this case the earth was so unstable and variable that the character and size of the bracing were necessarily often changed. Mr. Carson tried in this trench what was to the writer a new kind of bracing, never having seen it before, either in America or England. It consisted of planks placed horizontally, as shown in Fig. 4, each one being braced as it was put in with a three-inch plank. These braces had blocks of wood (any waste pieces) filled in between them, making, as it were, one brace from top to bottom of the trench. This trench, which in the writer's opinion would have failed in three days with ordinary bracing, stood for two weeks, and at the end of that time showed no signs of failure, but looked as strong as when put in. This trench was not in quicksand, but in a very unstable mixture of gravel and marsh mud.

It frequently happens in trenches in bad ground that the sheeting on one side will settle more than on the other. If it is a narrow trench, diagonals can be easily put in from the top of a ranger on one side to the under side of the next one above it on the opposite side, and so on. In wide trenches, however, it is necessary either to run the diagonals to every other line of rangers or truss between the braces.

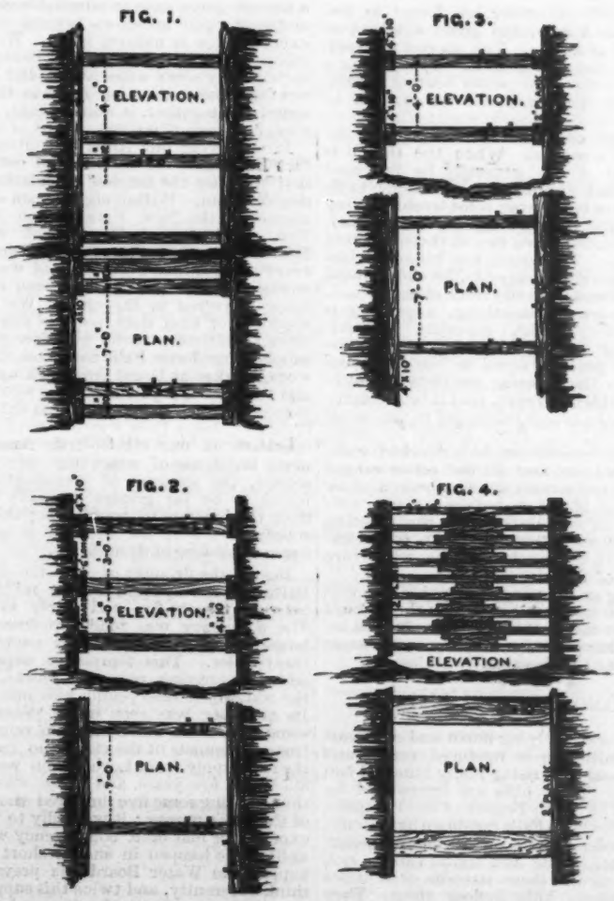
Many times the writer has found that the sheeting could not be driven down any farther by hand power when only a foot or two remained to be driven. It had become timber-bound either from the pressure of the bulkhead or some other cause. He has then generally found it cheaper to put in a set of poling-boards, as shown in fig. 2.

The writer thinks there is need of some kind of a light machine for driving sheeting—something that is cheap and can be easily moved. In a bad trench there is frequently much trouble because the planks cannot be driven quick enough—the material comes in under the plank as fast as you can dig it out. Some machine like a steam drill, it seems to the writer, might be used. A light drop-hammer was used on the Back Bay Park and on Section 4½ of the Improved Sewerage, which seemed to work well. The guides for the hammer were welded to a wrought-iron sheeting cap, and the hammer was raised by two men using a rope passing over a pulley suspended above. Planksp were driven by this simple machine which could not be started with the ordinary mauls.

The writer was in England about four years ago, and saw the new dock works at North Woolwich. Here each plank had a hard-wood wedge between

* Abstract of paper by Mr. William Whittaker, before the Boston Society of Civil Engineers, presented at regular meeting, June 15, 1881.

SHEETING AND BRACING OF SEWER TRENCHES.



it and the ranger, and at the points where the braces were placed a 12-in. × 12-in. was driven below everything, so that the braces and rangers would not go down on each side. These piles were also used to support a track for removing the material.

In ordinary trenches, from thirteen to sixteen feet deep, the writer has found the cost of bracing to be as follows:

Placing the planks, three sets of rangers and braces, per foot run	15 to 20 cents.
Driving the sheeting	15 to 20 "
Pulling the planks	15 to 20 "
Loss on planks	5 to 10 "
Total per foot run	50 to 70 cents.

If the trench is over 16 ft., say from 20 to 30 ft., requiring two sets of sheeting, the cost will be more than double the above amount. It is to be understood that these prices are for bad trenches in running sand, and braced as shown in fig. 3.

The following prices may be considered a fair average for ordinary trenches from 20 to 30 ft. deep, in running sand, etc.:

Placing planks, braces, etc	$0.75
Driving sheeting	.50
Pulling planks	.75
Loss on planks, etc	.25
Total per foot run	$2.25

One great trouble the writer has found in bad ground is that, as a rule, too great a length of trench is opened at a time. The shorter a trench can be worked, the better it is. By opening a greater length in the same water-bearing strata, you only increase the amount of bad bottom to look out for.

There is always considerable trouble with the bulkhead part of a section. When the trench is in good material it can generally be dispensed with, but in bad ground it is impossible to do without it. There is one way considerable saving can be made in the pressure against a bulkhead, and that is by digging down two or three different sections at a time. The writer has found in bad trenches it is generally cheaper in the end to build a good bulkhead and keep the work close up.

In putting in second sheething, a packing is placed behind the planks, generally a sheeting plank, and another in front, the distance from the packing equal to the thickness of the sheeting. The sheeting can then be put in as at first, with this difference, that it is necessary to notch out for the braces belonging to the set of sheeting already driven. If the ground is pretty good, the lower braces can be dispensed with, leaving in the rangers, and set the other ranger for the inside of the second sheeting with a plank at each brace, or block in between them with wedges, which can be taken out as the sheeting planks come to them. This will make considerable difference with the notched planks, which are always a source of trouble.

In the sheeting and bracing of trenches, the well or pump makes considerable saving in the amount of pumping, but many are of little value on account of not being properly braced, or for want of care in starting the sheeting.

THE BALTIMORE WATER SUPPLY.*

The part of Maryland lying north and northeast of the city of Baltimore is rendered varied and picturesque by bold hills rising many hundred feet above mean tide. These hills are intersected by rapid streams. The North Branch of the Patapsco, Jones Falls, and Gwinn's Falls run down by the city, but the Gunpowder River is, at its nearest point, nine miles distant. Wide and fertile valleys, rich in pasture-land, receive these streams, or at times close and precipitous hills inclose them. They flow peacefully through a settled country, by railroads, turnpikes, canals and country villages, and are seldom disturbed except by the slow, sleepy swish-swash of the dark water-wheel of some rural grist-mill.

Jones Falls alone really flows into the city. We whisper it only, but Jones, it is claimed, was really the pioneer of the olden settlement at the mouth of the falls named after him, afterward more fashionably christened after its patron, the Lord Proprietary. The Falls—still so called because there are no falls on it, perhaps—if it does not fall, at least often rises very unexpectedly, and several times has taken possession of adjacent streets, which are largely devoted to second-hand goods, old clothes and old iron, causing a rapid exodus of their inhabitants. It has, in fact, a way of supplying suddenly more water than is convenient, and again of not giving enough for daily household use. For Jones Falls has furnished hitherto the entire consumption of the city. On it, near the town, the old Baltimore Water-Works were built by a private corporation in days wherein the memory of living man runneth not, and on an adjacent hill in a thick grove was the "Reservoir," around whose margin promenaded belles in high-heeled shoes and balloon petticoats, with gallants in knee-breeches, embroidered coats and lace ruffles, and where walked also in more sober guise their grandchildren. The Falls then was a fresh, pure stream, and carried into the city the memory and the hue of its pristine springs. But as population crowded above the source of supply to the old water-works, it became evident that both in quality and quantity there was a necessity for a change for the better. This was as late as 1850. The works of the Baltimore company were bought by the city, and a conflict of opinion began in the usual fashion between citizens with crotchets, civil engineers with or without axes to grind, and the papers, as to the best source of permanent supply. Jones Falls, six miles distant, at the Relay, now Hollins Station, Northern Central Railroad, where Lake Roland now is; the Patapsco, at the North Branch, by pumping; Gwinn's Falls, also by pumping; and the Gunpowder River, nine miles from the city—were all thoroughly canvassed. It was decided to take Jones Falls at the Relay, where a narrow gorge gave an admirable place for a dam, and level, open meadows beyond seemed formed expressly for a natural basin. Work was commenced in 1858. Jones Falls, issuing from large springs only seven miles above, and Roland's Run, coming from a direction more to the north, here unite, and together, it was thought, the daily flow would average 17,000,000 gallons of water.

In supplying our American cities, however (a fact Baltimore was soon to find out), it is always best to make the amplest calculations—and then double them. Within eight years after the completion of the New York Croton Aqueduct, the New York Water Department wrote: "This Board warns the City Council, and through it every citizen, that every drop of water which the works in their present state can supply is now being delivered in the city." We need not cite warnings of later date, nor the example of other cities. Baltimore found in a few years that the supply from Jones Falls and from the connecting storage lakes at Druid Hill Park was insufficient, and that the Gunpowder River would have to be turned on much sooner than was anticipated. The failure of Jones Falls was due to three causes, all operative in our cities—first, Americans make more lavish use of water than any other people; second, the increase of consumption has been found to be far greater annually in proportion than the increase in population; third, when the supply is lowest the demand is greatest—as in times of prolonged drought.

During the drought of 1880 the daily supply of Baltimore ran up from sixteen million gallons to between twenty-five and thirty million gallons. The deficiency was made up from storage, and largely from the "temporary supply" from the Gunpowder. This temporary supply had been added by erecting pumping works, and forcing the water over intervening hills into Lake Roland. Its necessity was seen many years ago, but for some time there was a vigorous opposition by the close economists of the city, who contended that the full supply from Loch Raven would be available in a few years, and there was no need of thus wasting some five hundred thousand dollars of the city's money; it was folly to go to such an expense for fear of a contingency which was so unlikely to happen in such a short period. But happily the Water Board was prevailed upon to think differently, and twice this supply has saved the city from a water famine, and perhaps incalculable damage.

It was contemplated from the beginning to bring on, as the population increased, the waters of the Gunpowder, which is dignified by the name of a river, while Jones Falls and Roland's Run are only large streams. It was not expected, however, that the full supply of the river would be needed before nearly the end of the century. As it happened, the Jones Falls works were completed in 1861, and on Oct. 31, 1881, the waters of the Gunpowder will be turned into the city mains, and Baltimore will possess as permanent, as complete, as economical, and as abundant a flow of pure water as any city in the world.

Lake Roland, the first of the series of lakes and reservoirs on the north and east of the city to be constructed, is surrounded by high hills, on which are many private residences, an winds like a river, with abrupt curves above the dam, then expands into a long and broad sheet of water, and after another abrupt curve divides, one branch going northwest, up the valley of Jones Falls; the other north, up the valley of Roland's Run.

Through all its course it lies deep among the hills, and reflects sharply their shadows in its clear waters. There are distant and beautiful views, where the landscape at times counterfeits in miniature a mountainous country, side by side with the most cultivated and gently rolling valleys. The former begins in a singular rocky geological formation known as the "Bare Hills," wherein are found copper, chrome, garnets and other minerals in small quantities

The waters of Lake Roland are conveyed to Hampden Reservoir by a conduit, and from thence to Druid Lake, in Druid Hill Park. The latter gives the park what at first it so much lacked—a water view; not large or varied, but, taken in connection with the sight of the city, the northwestern portion of which it overlooks, very attractive.

On the Gunpowder River there is a different scenery—no extensive view or fertile valley, but precipitous hills, rugged and almost inaccessible at Raven's Rock, where Loch Raven begins, and clothed with hemlock and pine, closing in a narrow river-bed, and gradually decreasing in wildness, until they end at Meredith Ford, five miles distant, in a pastoral country, where in summer cows wade deliberately out into the shallow river, in sight of huge white-canvased wagons coming down from the up-country and Pennsylvania.

A wide road has been made on each side of the lake, and all the streams are spanned by strong and tasteful bridges of Maryland marble. The dam is cased with the same stone, and both here and at the other lakes it is largely used. Those who have seen the public buildings of Washington city will appreciate the fine effect of the material employed in these constructions.

From the first the same engineer, Mr. Robert K. Martin, has been in charge, and he probably regards the tunnel from Loch Raven to Lake Montebello as his most difficult task. It is the longest, we believe, in the world, being seven miles in length, and with a depth of from 65 ft. at its minimum to 163 ft. at its maximum, where it passes under Sater's Ridge. The first mile was through limestone rock penetrated by innumerable springs, and the last five through hard blue gneiss. It was divided into mile drifts, and the cuttings all came true. This tunnel cost nearly $2,000,000. It empties the waters of Loch Raven into the great storage lake of Montebello, named after the adjoining country-seat of Mr. John W. Garrett; and just across the Harford Road is Lake Clifton, on the estate left by Johns Hopkins, for a public park, and for the site of buildings for the Johns Hopkins University.

So that the city of Baltimore now has Lake Roland, with the storage capacity of Druid Lake and Hampden and Mount Royal reservoirs, and, from the Gunpowder, Loch Raven and the large storage lakes of Montebello and Clifton. But Baltimore is a city built, as to its northwestern position, on very high hills, and even the highest of these sources of supply, two hundred and twenty-five feet above tide, can not be used when, as in many instances, the level of the curb of the streets is found to be from one hundred and seventy to two hundred and twenty feet above tide. So a high-service reservoir was added, supplied by pumps, and now water can be sent to the top of Washington's monument if necessary, and the water service of the city is complete. Moreover, the whole supply, with the exception of the high service, comes rushing down by natural flow, and, thanks to Mr. Martin, Mr. Manning, and their assistant engineers, the work has been economically and permanently done, ample for this generation and the next—one hundred and fifty million gallons daily, for a population which at present does not consume thirty million gallons. Baltimore does not know what to do with it. The talk is of fountains and public baths and of flushing the inner harbor. Its use will certainly be permitted for manufacturing purposes, and taken in connection with a recent law exempting plant so used from taxation it is expected to greatly benefit the city's trade. This is a matter for congratulation, but another source of gratification remains, and that is, that incredible as it may seem to some of her sister cities, the whole interest on ten millions of bonds issued for the Lake Roland and Gunpowder supply has been met by the revenues of the Water Department and the work was done within the estimates, and it is well done. These revenues are derived from a system of easy water rates, and are over six hundred thousand dollars annually, which may be largely increased when the Gunpowder supply is in full operation, if desired, but it is probable the rates will be reduced, as the

* A page of illustrations which we do not reproduce, accompanies this article.

Water Department has never been looked to for surplus revenue. The rates are, on private houses, five to fourteen dollars annually; warehouses, from six to ten dollars. There are also special supplies, and supplies by meter where water is desired in large quantities. Much credit is due to the Water Board for able management, and the fact that the members serve without pay, and that these places are no political sinecures, nor are sought after by politicians, has a great deal to do with it. Citizens of Baltimore of high standing and tried business capacity have an excellent way of thus serving the city, at much personal inconvenience. It is to the credit of the Water Board that nearly all the subordinate officers have what may be considered permanent places, and its business has been transacted quietly, skillfully, without frequent changes to suit party managers, economically and effectively. It is more like a well-managed private corporation than a public one, and with an expenditure of so many million dollars, and with heavy contracts to give out, it stands without a complaint against it of partiality or corruption.—*Harper's Weekly, Oct. 8.*

ENGINEERS' SOCIETIES.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

At a meeting of the above society, held Wednesday evening, Oct. 19, Mr. T. C. Clarke presented a résumé of the paper by Messrs. Clarke, Reeves & Co., on "Experiments upon Full-Size Phœnix Columns," which was presented at the last annual convention. In the discussion upon this paper, Mr. Charles E. Emery, Prof. De Volson Wood and Mr. Cooper participated, and a written discussion from Mr. L. G. F. Bouscaren was read. The paper was further discussed by Messrs. A. S. C. Wurtels, C. L. Gates, D. J. Whittemore, Wm. H. Burr, Prof. Mansfield Merriman and C. L. Strobel. The discussion upon the same subject will be continued at the next meeting.

ENGINEERS' CLUB OF PHILADELPHIA.

The first meeting of the season was held at the rooms, on Saturday evening, Oct. 15, 1881; President Strickland Kneass in the chair; 27 members present.

The Secretary exhibited on behalf of Mr. J. Milton Titlow, screws which had, for 6¾ years, held together three 2-in. courses of yellow pine planks in the floor of Fairmount Bridge, Philadelphia, which planks had been treated in some manner with creosote. The screws in question are much corroded, the original diameter being diminished about one-third at the middle of the screw, where the fiber of the iron is distinctly exposed. It seemed, however, to be the universal opinion of the members present that the corrosion was due entirely to the presence of water between the planks, and not at all to the creosote oil, which would preserve rather than destroy the iron.

The Secretary exhibited copies of a drawing which had been made by a method giving more economical and better results in many instances than the ordinary blue process. Mr. Frederic Graff stated, in this connection, that the ordinary letter-press was the invention of Watt, and that the original was still in existence.

The Secretary read a detailed description of the moving of the Hotel Pelham, at Tremont and Boylston streets, Boston, for the purpose of widening Tremont street. This hotel is built of freestone and brick, 96 and 69 ft. frontage. The Boylston street wall is supported on 8 granite columns 12 ft. high, 3 and 4 ft. square. There is a basement and seven stories above the sidewalk. Height above tramways on which it was moved, 96ft. Weight 5,000 tons, exclusive of furniture, which was not disturbed during removal, as also were not the occupants of the stores on first floor and some of the rooms, the various pipe connections being kept up with flexible tubes. Careful experiments with models showed that if the lower part of the building was firmly braced, there was no danger of shifting in the parts above. The general arrangements consisted of heavy and substantial stone and brick foundations for iron rails and rollers, and the building was forced to its new position by 56 screws, 2 in. diameter, ½ in. pitch, operated by hand against timbers arranged to uniformly distribute the pressure against the building. Much care and ingenuity was displayed in the details of the arrangements and work. Two months and twenty days were occupied in preparation. The moving itself was begun on August 21 and finished on August 25, but the actual time of moving was 13 hours and 40 minutes. The greatest speed was 2 in. in 4 minutes. The hotel moved about ⅛ in. at each quarter turn of the screws. The whole distance moved was 13 ft. 10 in. 4,351 days labor was required for the work. The whole cost was about $30,000. This is the largest building that has ever been removed, although larger have been raised, which latter is a much simpler and less risky operation. The complete success of this undertaking is shown by the fact that cracks, which existed in the walls prior to removal, were not changed by the operation. Paper was pasted over them before commencing, that any change might be seen.

President Strickland Kneass exhibited a drawing which had been sent to him by telegraph during his recent visit in Europe.

Prof. L. M. Haupt exhibited a note book, loaned by Mr. John C. Trautwine, containing many complete and beautiful sketches of bridge construction, notably of the celebrated Wernwag Bridge, which crosses the Schuylkill at Callowhill street.

An informal discussion of the necessity and desirability of obtaining better and more extensive quarters for the Club occupied the remainder of the session.

HOWARD MURPHY,
Secretary and Treasurer.

Velocity of Wind.		Pressure in Pounds per square foot Normal Plane Surface=P.						Names Given to Winds		
				Hagen, eq. (2).						
Feet per second.	Miles per hour=V.	Rouse, eq. (1).	Hutton.	Circular surface.	Square surface.	Triangular surface.	Smithsonian Institution.	Smeaton—Rouse.	Smithsonian Institution.	Classification by Smithsonian Institution.
0.	0	0					0.		Calm	0
1.47	1	0.005	0.004	0.003	0.003	0.004		Hardly perceptible		
2.93	2	0.02	0.016	0.014	0.014	0.014	0.02		Very light breeze	1
4.4	3	0.044	0.036	0.03	0.031	0.032		Just perceptible		
5.87	4	0.079	0.065	0.054	0.055	0.057	0.08		Gentle breeze	2
7.33	5	0.123	0.101	0.085	0.086	0.088		Gentle, pleasant, wind.		
14.67	10	0.492	0.405	0.339	0.345	0.353				
17.6	12	0.711	0.583				0.75	Pleasant, brisk gale	Fresh wind	3
22.	15	1.107	0.911	0.763	0.777	0.795				
29.34	20	1.968	1.62	1.356	1.382	1.413		Very brisk.		
36.67	25	3.075	2.531	2.119	2.159	2.208	3.		Strong wind	4
44.01	30	4.429	3.645	3.052	3.109	3.18		High winds.		
51.34	35	6.027	4.961	4.154	4.232	4.328	6.		High wind	5
58.68	40	7.873	6.48	5.425	5.527	5.653		Very high.		
66.01	45	9.963	8.201	6.866	6.996	7.155	10.		Gale	6
73.35	50	12.3	10.125	8.476	8.637	8.833		A storm or tempest		
88.02	60	17.715	14.58	12.208	12.437	12.719	18.	A great storm	Strong gale	7
110.	75	27.65	22.781						Violent gale	8
117.36	80	31.49	25.92	21.701	22.11	22.613		A hurricane		
132.03	90	39.852	32.805						Hurricane	9
146.70	100	49.2	40.5	33.908	34.546	35.332		A hurricane that tears up trees and carries buildings before it.	Most violent hurricane	10

NOTE.—This table was in the paper read by Mr. Francis Collingwood, before the American Society of Civil Engineers April 6, 1881, and should have appeared in our reprint of last week, but, by an oversight, was omitted.

THE Shreveport (La.) *Standard* publishes a letter from General Manager John Scott, of the Vicksburg, Shreveport & Pacific Railway, from which the following is an extract: "Every effort is being made to complete that portion of the road intended to run from Monroe to Shreveport. The funds are all provided, and much exertion is being made to commence on the road as soon as possible. The Ouachita River bridge, which will cost in the neighborhood of $160,000, will be completed Jan. 1 next, and I hope within a few days to advertise the letting of that section between Monroe and Arcadia, a distance of 47 miles. The survey has been completed to within six or seven miles of the Red River, and that portion of the work is being delayed at present until I can pay a personal visit to the river to decide at which place the bridge will cross. When once started the contracts will be framed in such a way as to have the utmost expedition used. My company is anxious to get the work pushed through with the utmost celerity."

In the Senftenberg mine, Germany, an attempt to haul from a tunnel by electricity has been abandoned because the center rail for conducting the current could not be kept clear of ice in winter. It was supplanted by a rail running along the top of the adit, along which a conducting piece attached to the electric locomotive dragged. This, too, was a failure. The power of the engine for running the dynamo-electric machines was 15-horse power, that actually developed in hauling a train of 15 cars was 7.08 horse-power, thus showing a useful effect of 47 per cent.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

It has been decided to erect water-works in Goderich, and the deputation was instructed to make a thorough investigation regarding the estimated cost. They have been instructed to visit London, Hamilton and Port Huron, and to leave no stone unturned in order that the town may benefit by the experience of other places. The deputation will visit the Toronto Water-works and consult the engineers.

Water-works for Princeton College and the Borough of Princeton, N. J., are to be immediately constructed, taking in a supply from a well sunk in a water-bearing gravel on the banks of Stony Brook at Princeton Basin, a mile and a half from the college. Analyses of the water made by Prof. H. B. Cornwall show it to be of remarkably good quality. The plans for the work have been prepared by J. J. R. Croes, C. E., and it is expected that an ample supply will be furnished the college in a few weeks.

At the suggestion of Chief Engineer Bates, of the New York Fire Department, the Board of Aldermen have adopted a resolution, which the Mayor has approved, providing for the laying of 12-inch water mains in Maiden lane, between William and Pearl streets; Broad street, between Wall and South streets; Jackson street, between Cherry and Grand streets; Bond street, between the Bowery and Broadway; Fourth avenue, between Eighth and Thirteenth streets; Eighth street, between Fourth avenue and Lafayette place; Lafayette place, between Eighth and Great Jones streets; Great Jones street, between Lafayette place and Broadway; Fourth avenue, between Fifteenth and Thirty-second streets, and a 20-inch main in Canal street, between Orchard and Mott streets.

The Indianapolis Water Company has begun the construction of the new works for the supply of the city, in accordance with the recommendations of J. J. R. Croes, C. E., and under his direction. The pumping power will be increased by a 5-million gallon steam engine and pump, and a set of pumps of 4 million gallons capacity driven by the water power, for which the contract has been awarded to William E. Worthen, C.E. The point at which the supply is taken from White River being exposed to pollution, a siphon has been laid from the pump-well to deep water in the river where it is pure, for temporary use during the construction of the works for permanent supply, so that water of an excellent quality is now furnished instead of the impure water which has been distributed heretofore. The permanent works, now under way, consist of a supply pipe and conduit 7,000 ft. long from the pump well to a point north of Fall Creek on the bank of White River, where a filter gallery 500 or 900 ft. long will begin, to be laid so as to collect the water from the underground gravel 25 ft. below the river level. The water thus collected is of remarkably pure quality, as shown by the analyses, and is abundant in quantity. The city is now supplied by the direct pressure system, and there are some 45 miles of mains in use. As the old pumping station is favorably located for the distribution, it has been deemed advisable to retain it, and to bring the new supply to it, rather than to remove the works to a point further from the centre of distribution, though nearer the source of supply. J. H. Dennis, C. E., is the resident engineer of the extension of the works.

A NEW YORK CITY WATER FAMINE.—The continuance of dry weather and the daily reduction of the

water supply of this city have impelled Commissioner Thompson to issue the following notice to consumers:

DEPARTMENT OF PUBLIC WORKS,
NEW YORK, Oct. 15, 1881.

To the Public:

The extraordinary drought which has prevailed for more than three months has reduced the reserve supply of water in the Croton basin to an extent which gives cause for serious alarm, and calls for exceptional measures to preserve sufficient water for absolute daily necessities, and for protection from fire in the event of a continuance of the drought. The rainfall for July, August and September was only 4 $\frac{9}{100}$ inches—50 per cent. less than the lowest for the corresponding three months for the preceding fifteen years. From the report made to me by the chief engineers of the Croton acqueduct, the present condition of the supply may be briefly summarized as follows:

The daily consumption is upward of 95,000,000 gallons. The natural flow of the Croton River at this time is about 9,000,000 gallons per day. The reserve supply in the two storage reservoirs and the lakes from which the city has the right to draw water is reduced to 1,750,000,000 gallons, and about 490,000,000 gallons may possibly be obtained from other lakes by purchase, making the utmost available reserve 2,240,000,000 gallons. At the present rate of drawing on the reservoirs and lakes, and allowing for evaporation and absorption of water in its passage through Croton Lake to the aqueduct, this reserve would be used up in about twenty-three days.

Though a continuance of the drought for that period is not probable, it is by no means impossible; and in the present parched condition of the ground very copious rains are needed to produce any appreciable effect on the streams, lakes and reservoirs. It would be inexcusable negligence or folly to incur the risk of using up this entire reserve, and leave the city dependent on the 4,000,000 gallons daily furnished by the natural flow of the Croton River by continuing the present rate of consumption.

The present experience shows that the capacity for storing water in the Croton basin is still inadequate to make it absolutely certain that the aqueduct will be fully supplied in seasons of such extreme drought, as the present, and measures will at once be taken toward the construction of another storage reservoir on a site already selected.

It must not be supposed that the statements heretofore made in the reports of the department that the Croton basin is capable of furnishing a daily supply of over 200,000,000 gallons of water is controverted by the existing state of things. All that is needed to insure such a supply is sufficient storage capacity to retain the water in time of abundant rainfall, to be used at periods when the flow of the Croton is less than the capacity of the aqueduct.

A change has, however, taken place in one respect since the first surveys for the Croton system were made, forty-seven years ago, when the minimum flow of the Croton River was estimated at 27,000,000 gallons per day. All calculations of needed storage capacity have been based on that supposition, but observations show that at times the flow of the Croton is less than one-third of that quantity. The change is no doubt due to the reduction of the forest area in the Croton basin by its conversion into meadows and fields and to the drainage of marshy land. The ground retains to a less extent the water from rainfalls. The water runs immediately into the streams, and the consequence is that they rise and fall more rapidly with alternate rainy and dry weather. The year 1880 was the dryest in twelve years. The average daily flow of the Croton for the whole year was 241,000,000 gallons. In January the average was 587,000,000 gallons, and in the summer months it fell to 9,000,000. Of course it is only necessary to have sufficient storage capacity to deliver the daily average, minus evaporation, at the head of the aqueduct each day. In the present emergency the necessity of curtailing the consumption of water is imperative, and the only practicable way of doing it is by closing down still further the outlet gates of the main distributing reservoir. This may have the effect of depriving a few limited localities of the water supply, but the people must be prepared to bear this temporary inconvenience, which is as nothing compared to the danger from water famine and conflagration which we would otherwise incur.

At the same time I renew the appeals so often made for a discontinuance of the wanton waste of water which still prevails in many houses. It is a common occurrence to find water running into the sewers from private house drains at the rate of a gallon per minute, between the hours of midnight and 6 a. m., when there can be scarcely any legitimate use of water. Considering the extent of the city and the number of places where this occurs, the volume of water thus wasted is immense, and a stoppage of this waste would go very far toward relieving us of anxiety as to the water supply in this emergency. Such waste at this time is absolutely criminal.

Orders have been issued to stop the street sprinkling and the supply of water to the fountains in the principal parks.

The closing down of the gates of the distributing reservoir so as to lessen the outflow and consumption of water was commenced to-day.

HUBERT O. THOMPSON,
Commissioner of Public Works.

The following orders were issued yesterday:

DEPARTMENT OF PUBLIC WORKS,
COMMISSIONER'S OFFICE,
31 CHAMBERS ST., NEW YORK, Oct. 15, 1881.

John H. Chambers, Esq., Water Register:

SIR: In consequence of the extreme drought and the rapid diminution of the reserve supply of water in the storage reservoir and lakes in Putnam County, all street sprinkling will be discontinued after this day, unless otherwise ordered.

You will please notify the licensed sprinklers accordingly, and see that this order is promptly carried out.

Respectfully, HUBERT O. THOMPSON,
Commissioner of Public Works.

DEPARTMENT OF PUBLIC WORKS,
COMMISSIONER'S OFFICE,
31 CHAMBERS ST., NEW YORK, Oct. 15, 1881.

To the Commissioners of the Department of Public Parks:

GENTLEMEN: The extreme and protracted drought has caused such rapid reduction in the reserve supply of water in the storage reservoirs and lakes in the Croton Basin that the curtailment of the use of water to absolute necessities, as far as practicable, becomes imperative. I deem it necessary, therefore, to stop the supply to the fountains in the public parks, and have to request that you will take measures to close them at once.

Very respectfully, HUBERT O. THOMPSON,
Commissioner of Public Works.

RAILROADS.

A scheme to bridge the Ottawa, so as to connect Hull with the lower part of the city of Ottawa, is on foot. The estimated cost is $350,000.

The standard rail used by the Pennsylvania Railroad Company weighs sixty-seven pounds to the yard on the main line and sixty to the yard on its branch roads.

The surveys and cutting out the right of way line of the Ontario Sault Ste Marie Railway is progressing vigorously. The survey of 40 miles has been completed.

The officials of two or three railroads have lately visited Niagara Falls with a view to the construction of a new railway bridge across the falls. It is said the survey has been made.

The conflict between Vanderbilt and the Grand Trunk of Canada is said to rage with more bitterness than ever before. It is intimated that henceforth there will be no intercourse or exchange of traffic between them.

The Ontario Southern Railroad Company, running from Stanley, N. Y., to Sodus Bay, Lake Ontario, has been purchased by Sylvanus J. Macy, of Rochester, formerly receiver of the Rochester & State Line Railroad Company. The road is at once to be put in order and properly equipped with rolling stock.

Chief Engineer Genung, of the Evansville & Terre Haute road, gives very favorable reports as regards building a branch of the road from Cynthiana to Mount Vernon. An easy line over which to construct the road has been surveyed, and elections have been ordered in several townships to vote aid to the enterprise.

The Board of Directors of the Profile & Franconia Notch Railroad recently elected is as follows: Emmons Raymond, of Boston; John H. George, of Concord; Samuel N. Bell, of Manchester; Walter Aiken, of Franklin; Joseph A. Dodge, of Plymouth; John A. White, of Concord; Edward Spalding, of Nashua, and Isaac Cruft, of Boston.

Work on the Massachusetts Central Railroad is being pushed with the intention of having the track laid to Ware before the end of the year. Connection has been made with the Worcester & Nashua Railroad at Oakdale, and if possible, regular trains will be running to Oakdale by Nov. 1. More than a mile of track was laid in West Boylston Thursday.

Mr. H. D. Lumsden, Chief Engineer of the Ontario & Quebec Railway, says that the survey of the branch connecting the Kingston & Pembroke Railway at Sharbot Lake with the Canada Central at Perth will be completed about the beginning of December. The work is already done from Perth as far as Moberly, eight miles. Rock cutting will be done during the winter.

President George B. Roberts, Vice-President A. J. Cassatt and the entire Board of Directors of the Pennsylvania Railroad Company have made the regular annual inspection of the main line, branches and connections of the road, with the depots, stations and workings of the company's offices, starting from Philadelphia. The trip will occupy the entire week, and will cover 4,000 miles of railroad.

Articles of association of the New York & Council Bluffs Railway Company have been filed with the Secretary of State of Indiana. The main road crosses the State at or near the forty-first parallel, and a branch beginning in the southeast corner of Adams County passes through Adams, Wells, Huntington, Wabash & Miami Counties, giving a total length in that State of 230 miles. The capical stock is $5,000,000.

The Suburban Rapid Transit Company are actively progressing with their preparations for the construction of their roads north of the Harlem River in New York city. Much of the right of way has been secured, and the location of the bridge across the Harlem River at the end of Second avenue to connect with the Manhattan Elevated Railway system has been approved by Gen. Newton, the U. S. Engineer in charge of the Harlem River improvement. This location was determined by Mr. J. J. R. Croes, the engineer of the company, from a thorough set of borings showing the strata in the river bed to a depth of 40 to 60 ft. below the surface, made by Messrs. Spielmann & Brush, Civil Engineers. The routes of the Suburban Company were fixed in 1880 by a commission under the general Rapid Transit Law, and are so arranged as to encroach on no streets, thus affording safe rapid transit through the new wards without injury to public or private property. It is understood that the stock of the company is held by very strong parties, who propose to build the road at once.

PENSACOLA & ATLANTIC RAILROAD.—Work is progressing at both ends of this line. Eight hundred tons of steel rails are now afloat for the road. Nearly 8,000 tons more have been bought by the company for delivery during the next six months. One hundred and five miles, being that portion of the line not under contract, will be let Oct. 10. Iron draw-bridges will be used at Escambia Bay and at Blackwater, Choctawhatchee and Apalachicola rivers. The bridge at Escambia Bay will be two and a quarter miles long, and will be creosoted. At Apalachicola the bridge will be 800 feet long, with one draw and four fixed iron spans. The iron spans are being constructed by the Louisville Bridge Company. The Western locating corps, under Assistant Engineer Wells, is locating near Yellow River. The eastern corps is at work between Marianna and the Choctawatchee River, under Assistant Engineer Pickett. The steamer Mobile will be used to carry material to Escambia Bay, Milton and the crossing point of the Choctawatchee River. Rails and other material will be sent to Chattahoochee via Eufaula, and track laid to Marianna at once. The road will be finished by January, 1883, if money can secure the necessary men. It is entirely a question of labor. Rumors of a $15,000 depot on the hill prevail, and rejoice the public generally. The first twelve miles east of Pensacola, on the Pensacola and Atlantic line, will be the handsomest water view on the American continent.—*Pensacola Gazette, 4th inst.*

FLORIDA NEWS ITEMS.—The first lot of two hundred tons of steel rails of the Sanborn patent, purchased by the Jacksonville, Pensacola & Mobile Railroad, has been shipped, and will be placed on the road as soon as they arrive....There were filed in the office of Secretary of State at Tallahassee lately, new charters for the following railroads, navigation and telegraph companies: The Tavares, Orlando & Atlantic Railroad; the Tavares, Brooksville & Gulf Railroad; the Tavares & Lake Monroe Railroad; the Apopka Branch of the South Florida Railroad; the Bartow & Tampa Bay Railroad; the Kissimmee, Okeechobee & Gulf Navigation Company, and the South Florida Telegraph Company. All in South Florida....Grading is rapidly progressing on the Florida Southern Railway between Ocala and Orange Lake. L. O. Gould, C. H. Williams, G. Hoyt and L. DuBois are the principal contractors....Mr. U. J. White, of the St. Johns & Halifax Railroad, Fla., has been in New York lately for the purpose of purchasing a cargo of iron for his road. This road is to run from a point near San Mateo to the Halifax River, and already three miles of iron has been laid....The Lake Monroe & Lake Jessup Railroad Company, Fla. has purchased the franchise, road-bed, right of way, etc., of the Lake Jessup, Osceola & Kissimmee River Railroad and Navigation Company, whose line extends from Lake Jessup to the headwaters of the Kissimmee River, and has been graded from Tuskawilla, on Lake Jessup, to Orlando. By the union of the two lines, the northern terminus of the road will be Lake Monroe instead of Lake Jessup, so says the Sanford *Journal*....A declaration for the incorporation of the Florida & Alabama Northern Railway Company was filed in the office of the Secretary of State at Montgomery on Monday last. Its northern terminus is on the Tennessee River, at or near Guntersville; its southern terminus on the line between Florida and Alabama, in the direction of Chattahoochee. The line of the proposed railway, to make the shortest route from Chattahoochee to Guntersville, would run by Troy, crossing the Montgomery & Eufaula Railroad between Montgomery and Union Springs, and the Western Railroad about Chehaw; thence it would run by Dadeville, Oxford and Gadsden to Guntersville. A deflection of less than forty miles would bring it by Montgomery, and the *Advertiser* urges on the people of Montgomery the importance of making this connection. It is said that the road will be a narrow gauge, and will cost about $6,500 a mile....The length of the contemplated Live Oak & Rowland's Bluff Railroad, Fla., is, according to the surveyor's profile, one hundred and sixty-eight miles from Live Oak to Tampa. The most difficult portion to build will be near the Withlocoochee River, in Hernando County....Orlando *Reporter:* "The final arrangement for the building of the Apopka branch of the South Florida Railroad has been made, and work on the line will be commenced at an early day. This will aid materially in developing the western portion of the county."....Large numbers of colored laborers are daily applying for work on the new Atlantic and Pensacola Railroad. ....We are informed by the contractor, Col. Lawton, that the St. Augustine Road, Fla., will be prosecuted toward completion with reasonable progress....The engineers for surveying the route of the proposed Green Cove Spring & Melrose Railroad, Fla., have arrived, and will soon commence the survey....The grading of the extension of the South Florida Railroad from Orlando to Lake Tohopokaliga is nearly finished and ready for the cross-ties and iron....Lake Eustis *Semi-Tropical:* "Railroad iron has been purchased to build a ship railroad from Lake Dora to Lake Eustis, of capacity to carry barges loaded with lumber across the land between the lakes. Forty cottages are to be built at once. A hotel of 150 rooms is contracted for now. A bonus of $5,000 has been granted to the St. Johns & Lake Eustis Railroad to extend their road to the new town site. The Ocklawaha River is to be opened 40 ft. wide and 4 ft. deep, from Lake Dora to Lake Apopka. This will drain the Great Apopka Prairie, and reclaim 20,000 acres of the richest land in the State. An engine of 120 horse-power has been purchased in addition to the mill now there of 80 horse-power.